Qiang Xu

+1 (401) 396-6864 | xu1201@purdue.edu | qiangxu1996.github.io | 465 Northwestern Ave, West Lafayette, IN 47907

RESEARCH INTERESTS

I am interested in Mobile Systems, Edge Computing, and their intersection with Machine Learning. My current research focuses on understanding and improving the performance of ML-powered AR systems.

EDUCATION

Purdue University   *West Lafayette, USA*
Ph.D. in Electrical and Computer Engineering   *Aug. 2018 – Present*

University of Science and Technology of China (USTC)   *Hefei, China*
B.E. in Computer Science and Technology   *Aug. 2014 – Jun. 2018*

EXPERIENCE

Purdue University   *West Lafayette, USA*
Graduate Research Assistant   *Aug. 2018 – Present*
Advisor: Prof. Y. Charlie Hu

DNN Serving for Concurrent Edge-Assisted AR Clients
- Designed a framework that maximizes the capacity of a GPU server in serving edge-assisted AR clients.
- Implemented an AR inference serving scheduler that proactively coordinates request streams from AR clients.
- Supported 1.7x–6.9x more clients compared to various baselines while satisfying per-client accuracy drop thresholds.

Multitask Offloading in ML-Powered AR
- Designed an accuracy-centric multitask offloading framework that optimizes the overall accuracy of an AR app.
- Implemented an MPC scheduler that balances offloading frequencies among AR tasks.
- Improved the overall task accuracy by on average 7.6%–14.3% over the best baseline.
- Paper accepted to MobiCom 2023.

Understanding Edge-Assisted Object Detection Performance over 5G mmWave
- Implemented an edge-assisted object detection pipeline with state-of-the-art optimizations like local tracking.
- Emulated 5G mmWave and LTE uplink throughput and latency for system performance measurement.
- Paper accepted to MASCOTS 2023.

Understanding the Impact of Deep Parameters on Mobile App Energy Usage
- Surveyed 25 mobile app developers for their practices on deep parameters and energy optimization.
- Designed a framework that automatically identifies deep parameters in Android apps and measures their energy impacts.
- Systematically studied and categorized the energy impact of deep parameters in 16 Android apps.
- Paper accepted to SANER 2022.

Energy-Aware Adaptive Video Streaming on Mobile Devices
- Contributed to the design of the MPC-based energy-aware adaptive bitrate algorithm.
- Implemented a highly optimized simulator for the oracle adaptive bitrate schedule based on dynamic programming.
- Paper accepted to USENIX ATC 2021.

NEC Laboratories America, Inc.   *Princeton, USA*
Research Intern   *May 2023 – Aug. 2023*
Mentor: Murugan Sankaradas

Optimizing Edge-Assisted Video Analytics in the Presence of Network Contention
- Identified the interaction between client frame capture timings and batched DNN inference, and its impact on request drop.
- Designed a frame timing controller that dynamically adjusts clients' frame capture times depending on client count.
- Reduced the request drop rate by up to 92.9% under the same latency requirements.

PUBLICATIONS

AROSE: An Accuracy-Aware Proactive Framework for Serving Concurrent Edge-Assisted AR Clients
Jonny Kong*, **Qiang Xu***, and Y. Charlie Hu (* co-primary)
Under submission

Can 5G mmWave Enable Edge-Assisted Real-Time Object Detection for Augmented Reality?
Moinak Ghoshal*, Jonny Kong*, **Qiang Xu***, Zixiao Lu, Shivang Aggarwal, Imran Khan, Jiayi Meng, Yuanjie Li, Y. Charlie Hu, and Dimitrios Koutsonikolas (* co-primary)
31st International Symposium on the Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (**MASCOTS 2023**)

AccuMO: Accuracy-Centric Multitask Offloading in Edge-Assisted Mobile Augmented Reality
Jonny Kong*, **Qiang Xu***, and Y. Charlie Hu (* co-primary)
The 29th Annual International Conference on Mobile Computing and Networking (**MobiCom 2023**)

An In-Depth Study of Uplink Performance of 5G mmWave Networks
Moinak Ghoshal*, Jonny Kong*, **Qiang Xu***, Zixiao Lu, Shivang Aggarwal, Imran Khan, Yuanjie Li, Y. Charlie Hu, and Dimitrios Koutsonikolas (* co-primary)
The 2nd ACM SIGCOMM Workshop on 5G and Beyond Network Measurements, Modeling, and Use Cases (**5G-MeMU 2022**)

Can 5G mmWave Support Multi-user AR Apps?
Moinak Ghoshal, Pranab Dash, Jonny Kong, **Qiang Xu**, Y. Charlie Hu, Dimitrios Koutsonikolas, and Yuanjie Li
Passive and Active Measurement Conference 2022 (**PAM 2022**)

An Empirical Study on the Impact of Deep Parameters on Mobile App Energy Usage
Qiang Xu, James C. Davis, Y. Charlie Hu, and Abhilash Jindal
The 29th IEEE International Conference on Software Analysis, Evolution and Reengineering (**SANER 2022**)

Do Larger (More Accurate) Deep Neural Network Models Help in Edge-assisted Augmented Reality?
Jiayi Meng, Jonny Kong, **Qiang Xu**, and Y. Charlie Hu
ACM SIGCOMM 2021 Workshop on Network-Application Integration (**NAI 2021**)

Proactive Energy-Aware Adaptive Video Streaming on Mobile Devices
Jiayi Meng, **Qiang Xu**, and Y. Charlie Hu
2021 USENIX Annual Technical Conference (**USENIX ATC 2021**)

Awards

Ross Fellowship, Purdue University   *2018*
National Scholarship, USTC   *2016*

Professional Skills

Programming   Python, C/C++, Java
Platforms   Linux, Android, CUDA (TensorRT, Nsight), Docker
Frameworks   PyTorch, Mobile DL frameworks (ncnn, TensorFlow Lite), RL frameworks (Ray, Gym), Unity